NEXT GENERATION WEATHER RADAR PROGRAM

NEXRAD

OPERATIONAL SUPPORT FACILITY

WSR-88D SOFTWARE YEAR 2000 COMPLIANCE TEST PLAN

DRAFT

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1.0 INTRODUCTION

The Operational Support Facility (OSF) is responsible for software maintenance and development for the WSR-88D radar network, one of the major components of the National Weather Service Modernization Program. The WSR-88D system is critical to the protection of life and property by providing the forecaster with a tool that can accurately examine severe weather. Although the risk to the WSR-88D is considered low, it is imperative that this system not be affected by the Year 2000 phenomenon. This plan describes the testing the OSF will undertake to ensure that the mission critical WSR-88D software is ready to meet the new century.

1.1 BACKGROUND

Each WSR-88D system consists of three separate computer components, identified by their primary function: Radar Data Acquisition (RDA), Radar Product Generation (RPG), and Principal User Position (PUP). The hardware platform for each of these components is the Concurrent Computer Corporation 3280 Micro-Five. The operating system is Concurrent's proprietary OS/32, version 8-03.1.

Each of the three components runs a distinct set of applications software which is maintained by the OSF. There is also a suite of off-line RDA calibration programs known as the RDA System Operability Test (RDASOT). The currently fielded versions of the WSR-88D applications software are Build 9.0 (RDA and RDASOT) and Build 9.1 (RPG and PUP). Build 10.0 is currently undergoing system testing at the OSF and will be released to the field before the end of 1998.

In 1997 the OSF conducted a preliminary Year 2000 compliance assessment of the WSR-88D software, in accordance with NOAA Year 2000 Compliance Requirements (Appendix A). The operational applications software running on the RDA, RPG, and PUP was found to be 100% compliant. There was one off-line RDASOT utility which was not compliant. The fix for this utility has been implemented in Build 10.0 and will be tested during the full thread test.

In addition, eight Concurrent OS/32 operating system utilities were found to be non-compliant. These utilities will be evaluated and a decision will be made to upgrade to a Year 2000 compliant version or to change operational procedures in order to eliminate or minimize the impact of the non-compliance.

1.2 PERSONNEL

The OSF Year 2000 WSR-88D test team consists of:

Michael Briggs	Software Engineer
Brian Klein	Meteorologist/Software Engineer
Joe Chrisman	Meteorological Technician
Scott Enders	Systems Engineer
Jeff Engel	Electronics Technician
Chris Hunt	Computer Specialist (Configuration Management)

1.3 TEST FACILITIES

The preliminary assessment in 1997 was conducted on the Engineering PUP, Software Development System (SDS), and RDA Software Test System (RSTS) located at the OSF-South facility. Simulated radar data was used during this assessment. The full thread test will be conducted on the KCRI WSR-88D system located at the OSF-North facility. Use of this test system will allow use of actual radar data while eliminating the potential for introducing test data into the operational WSR-88D network. Some data analysis will be performed on the SDS and Applications Development System (ADS).

There are three possible configurations for a WSR-88D system: NWS/DOD Single (one RDA and one RPG), NWS Redundant (two RDAs and one RPG), and FAA Redundant (two RDAs and two RPGs). All three configurations will be tested.

The test will be conducted using Build 10.0 software. This version is still undergoing system testing, but it will be released to the field before the end of 1998. Any changes to the Build 10.0 software subsequent to this full thread test will be carefully checked to ensure there is no impact on Year 2000 compliance.

The evaluation of the OS/32 utilities will be performed on the Engineering PUP, SDS, and RSTS.

2.0 SCHEDULE

The full thread test is scheduled for May 2-10, 1998. These dates are subject to availability of the KCRI WSR-88D. The final test report will be completed within 45 days of the end of the test.

The OS/32 utilities will be evaluated from April 27 - May 15, 1998. A technical recommendation on whether the utilities should be upgraded will be made available by June 5, 1998 along with any suggested changes to operational procedures.

3.0 TEST APPROACHES

The model for all test cases will be the NOAA Year 2000 Compliance Requirements (Appendix A). The system clocks on the RDA, RPG, and PUP will be synchronized and transitions through such high risk dates such as 9/9/1999 and 1/1/2000 will be tested. Recognition of the year 2000 as a leap year will be checked as well.

The radar will be tested in Operate mode with full data flow, under both local and remote control. All three hardware configurations of the system will be tested. The RDASOT is an off-line program and will be tested separately from the other components. All radar data and products will be archived and checked for playback compatibility regardless of current system date.

The OSF has purchased an evaluation copy of the Year 2000 compliant Concurrent OS/32 utilities. These utilities will be tested for compliance with NOAA Year 2000 requirements and evaluated on the potential impact the upgrade would have on the WSR-88D system. If possible, procedural changes will be developed to eliminate the need to upgrade these utilities.

4.0 METRICS/DOCUMENTATION

The test cases for the full thread test will be considered pass/fail. User displays, radar data and products will be checked to confirm that all dates are handled correctly. Archived data will be checked to ensure that proper data retrieval is possible regardless of system date.

All Year 2000 related problems with the OS/32 utilities will be documented in order to help develop fall-back procedures in case the decision is made not to upgrade the WSR-88D network.

Appendix A - Year 2000 Testing Matrix

NOAA Year 2000 Compliance Requirements

Meaning of NOAA Year 2000 Compliance

The purpose of this document is to provide a definition for NOAA systems that are Year 2000 Compliant. Throughout the industry, the term year 2000 compliant remains ambiguous and ill-defined. To avoid confusion with less precise descriptions of year 2000 compliance, NOAA will use the term **NOAA Year 2000 Compliant** to identify systems which meet our definition. This document may evolve over time as we learn more about year 2000 requirements and testing.

I. To be **NOAA Year 2000 Compliant**, a NOAA system must be reviewed to confirm that it stores, processes (including sorting and performing mathematical operations), inputs, and outputs data containing date information correctly regardless of whether the data contains dates before, on, or after January 1, 2000.

II. Techniques: dates before, on or after January 1, 2000, may be interpreted and stored using either COMPLIANT or WINDOWING techniques. A system termed **NOAA Year 2000 Compliant** means that the COMPLIANT technique was used. However, compliance by WINDOWING may be used in circumstances where compliance by the COMPLIANT technique is impractical, or where WINDOWING is required to meet specific external interface requirements. If the windowing technique is used, it must be specifically documented in the system description. COMPLIANT and WINDOWING have the following definitions:

> COMPLIANT: All dates are stored, processed, input, and output in formats that preserve century, decade, and year information.
>
> WINDOWING: Dates are stored, input, or output in a format that preserves only decade and year information, but are processed through a sliding window calculation. For example, if the year is 00 to 60, add 2000, and if the year is 61 to 99, add 1900.There is no industry standard for the cut-off date used in such calculations, and therefore interfaces may not work correctly between programs or systems using different conventions. Any NOAA system achieving compliance through WINDOWING must clearly document the cut-off date and any other necessary information relating to the bridging calculation used.

III. Leap Year

The year 2000 itself must be correctly processed as a leap year, i. e., the two days following February 28, 2000, must properly be interpreted as Tuesday, February 29, 2000, and Wednesday, March 1, 2000.

IV. Display

When possible, any output or display of a date should use a four-digit year (YYYY). However, if two-digit display of a date is required and does not cause confusion, the year field may be displayed as two digits.

V. Firmware and Hardware

Any firmware, hardware, or networking component in a **NOAA Year 2000 Compliant** system must process dates in accordance with the requirements in this document.

VI. System Integration

Certification of NOAA Year 2000 compliance extends only to the specific system configuration tested, and does not include other software, firmware, or hardware components which may be used in conjunction with the tested configuration. For an NOAA system configuration consisting of multiple components to be considered **NOAA Year 2000 Compliant**, each constituent component, regardless of source, must be **NOAA Year 2000 Compliant** in accordance with this document, and the system as a whole must be tested for Year 2000 compliance. Constituent components include all software (including operating systems, programs, packages, and utilities), firmware, hardware, networking components, and peripherals provided by NOAA as part of the configuration.

VII. Year 2000 System Compliance Requirements

All of the following questions must be answered as indicated or NA for any NOAA system to be identified as **NOAA Year 2000 Compliant**. Any deviations from these responses must be specifically documented.

Although not required, it is highly recommended that "Test Assertions for Date and Time Functions" by Gary Fisher of NIST be used for testing date and time functions. The latest version of this document may be viewed at http://www.nist.gov/y2k/datetest.htm.

	DATE MANIPULATION QUESTIONS	NA	No	Yes	Required Value
	Does the system:				
1.	Use December 31, 1999, as a regular end of year without special meaning?				NA or Yes
2.	Treat September 9, 1999, as a regular day with no special meaning?				NA or Yes
3.	Do any of the following date field manipulations?				NA or No
4.	-99 indicates last record				NA or No
5.	-00 to indicate a null record				NA or No
6.	-99 and 00 default values				NA or No
7.	-Special interpretations of 00				NA or No
8.	-Hard coded 19 in 4-digit year field				NA or No
9.	-Separate manipulations of century digits				NA or No
10.	Include any license date expiries associated with the end of 1999?				NA or No
11.	Use dates in name constructions?				NA or No
12.	Mix date data and control information in commands or flags which are interpreted as one or the other depending on their values?				NA or No
13.	Use a date as part of the key of an indexed file?				NA or No

	YEAR AND CENTURY QUESTIONS	NA	No	Yes	Yes
	Does the system:				
1.	Recognize 2000 as a leap year?				NA or Yes
2.	Allow itself to be set to any date after 12/31/1999 including 02/29/2000?				NA or Yes
3.	Indicate the correct day, date and time when the following test is performed: With the date set to 12/31/1999, power the system off and then back on when the time will be in 1/1/2000.				NA or Yes
4.	Indicate the correct day, date, and time when the following test is performed: With the date set to some time after 1/1/2000, power the system off and back on.				NA or Yes
5.	Display the date correctly as 2/29/2000 when the following test is performed: With the date set to 2/28/2000, power the system off, and then back on when the next day has been reached.				NA or Yes
6.	Treat December 31, 1999, as a Friday?				NA or Yes

7.	Treat January 1, 2000, as a Saturday?				NA or Yes
8.	Treat February 29, 2000, as a Tuesday?				NA or Yes
9.	Treat December 7, 2000, as a Thursday?				NA or Yes
10.	Treat December 31, 2000, as a Sunday?				NA or Yes
11.	Treat January 1, 2001, as a Monday?				NA or Yes
12.	Treat March 1, 2000, as a Wednesday?				NA or Yes
13.	Treat February 28, 2001, as a Wednesday?				NA or Yes
14.	Treat March 1, 2001, as a Thursday?				NA or Yes

	DATA BASE ACCESS AND STORAGE	NA	No	Yes	Yes
	Does the system:				
1.	Code all years as in a manner that preserves century, decade, and year information?				NA or Yes
2.	Correctly perform all of the following manipulations across the century boundary?				NA or Yes
3.	-Computations of time spans, due-dates, etc.				NA or Yes
4.	-Sorting of data				NA or Yes
5.	-Selections based on key fields				NA or Yes
6.	-Selections based on non-key fields				NA or Yes

	OS & APPLICATION QUESTIONS	NA	No	Yes	Yes
	Does the system:				
1.	Display the year as an unambiguous value with a minimum of two digits?				NA or Yes
2.	Correctly handle data with dates before 1/1/2000, on 1/1/2000 and after 1/1/2000 with the system clock set to today's date?				NA or Yes
3.	Correctly handle data with dates before 1/1/2000, on 1/1/2000 and after 1/1/2000 with the system clock set to1/1/2000?				NA or Yes
4.	Correctly handle data with dates before 1/1/2000, on 1/1/2000 and after 1/1/2000 with the system clock set after 1/1/2000?				NA or Yes
5.	Correctly handle data with dates before 1/1/2000, on 1/1/2000 and after 1/1/2000 with the system clock set to 12/31/1999?				NA or Yes

6.	Correctly process dates with the system clock set to 12/31/1999 and processing allowed to continue across the century boundary?				NA or Yes
7.	Correctly handle date comparisons where one date is not greater than 12/31/1999 and the other date is not less than 1/1/2000?				NA or Yes
8.	Use a sliding window for year calculations?				NA or No
9.	Contain a date format that does not preserve century information?				NA or No
10.	Create and/or store data in files or log files or, or generate reports that do not preserve century information in date fields?				NA or No
11.	Use a 32 bit incrementing signed value for date and time?				NA or No
12.	Correctly set and maintain the century digits in the real time clock; if the system uses AT -class PC's (286 through Pentiums and clones), does the operating system or your system software correctly set and maintain the century digits in the real-time-clock?				NA or Yes
13.	Correctly handle all time interval calculations based on the century transition - both looking back into the past, and looking forward into the future?				NA or Yes
14.	Correctly handle future time interval calculations that span the century transition?				NA or Yes
15.	If required, correctly handle date and time interval calculations based on the use of data previously stored by the system or previous versions of the system?				NA or Yes
16.	Formally tested for year 2000 compliance?				NA or Yes

Appendix B - Acronyms

ADS	Applications Development System
DOD	Department of Defense
FAA	Federal Aviation Administration
NEXRAD	Next Generation Weather Radar (WSR-88D)
NWS	National Weather Service
OSF	Operational Support Facility
PUP	Principal User Position
RDA	Radar Data Acquisition
RDASOT	RDA System Operability Test
RPG	Radar Product Generation
RSTS	RDA Software Test System
SDS	Software Development System
WSR-88D	Weather Surveillance Radar - 1988, Doppler (NEXRAD)